M. Pinkerton

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ACUTE TOXICITY OF A NUMBER OF CHEMICALS OF INTEREST TO THE AIR FORCE

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TECHNICAL REVIEW AND APPROVAL

AMRL-TR-79-11

The experiments reported herein were conducted according to the "Guide for the Care and Use of Laboratory Animals," Institute of Laboratory Animal Resources, National Research Council.

This report has been reviewed by the Information Office (OI) and is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nations.

This technical report has been reviewed and is approved for publication.

FOR THE COMMANDER

Anthony A. Thomas

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Acute Toxicity	Salicyl Amino Guanidine
Skin Sensitization	2,6-Ditert-Butyl-Dimethylamino-p-Cresol
LD_{50}	N,N'-Disalicylidene-1,2-Propane Diamine
Skin Irritation	1,2,3-Benzotriazole
3-Amino-1,2,4-Triazole	Tricresyl Phosphate

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

A series of 20 chemical compounds used by the Air Force were evaluated for acute toxicity effects to establish safe handling guidelines. Skin sensitization potential, irritation effects and LD_{50} doses were determined for most of these materials. Of the compounds tested, nonyl phenol caused a skin sensitization reaction in 18 of 20 animals dosed and 1,4-dihydroxyanthraquinone which did not sensitize many animals, produced a very severe reaction in those affected.

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SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

Block 19.

1,4-Dihydroxyanthraquinone
Sulfurized 9-Octadecenoic Acid
Azelaic Acid
Dimer Acid
N-Benzyl-3,7-Dioctyl Phenothiazine
Phenothiazine
Dioctyl Phenothiazine
Sebacic Acid
Acryloid HF-866
Acryloid HF-844
Guanidino Salicylamide Salt
Nonyl Phenol
Phosphonate Salt
Tris(β-Chloroethyl) Phosphate

PREFACE

This technical report describes results of acute toxicity tests on a number of Air Force materials. The work was performed by the University of California, Irvine, Department of Community and Environmental Medicine, Toxic Hazards Research Unit at Wright-Patterson Air Force Base, Ohio under Air Force Contract No. F33615-76-C-5005.

The current contract for operation of the Laboratory was initiated in 1975 under Project 6302 "Occupational and Environmental Toxic Hazards in Air Force Operations," Task 01 "Toxicology of Propellants and Materials", Work Unit Number 63020115. K. C. Back, Ph.D., Chief of the Toxicology Branch was the technical contract monitor for the Aerospace Medical Research Laboratory.

INTRODUCTION

Acute toxicity tests were performed on a number of commercial chemical materials being considered for technical use application by the United States Air Force. This group of 20 materials is identified in Table 1 together with the physical state. A preliminary search of the literature and manufacturers information failed to reveal any published documentation describing acute toxicity of these materials and it was, therefore, necessary to conduct a series of tests to evaluate the potential toxic hazard to personnel handling the materials.

Acute toxicity and irritation potentials were evaluated by using the following tests:

1. Single dose oral LD_{50} in rats and mice.
2. Primary skin irritation in rabbits.
3. Skin sensitization in guinea pigs.

Unfortunately, the supply of some of the materials was limited necessitating a prioritization of the tests performed.

TABLE 1. LIST OF AIR FORCE COMPOUNDS SUBMITTED FOR ACUTE TOXICITY STUDIES

Material and Physical State
3-amino-1,2,4-triazole (solid)
Salicyl amino guanidine (liquid)
2,6-ditert-butyl-dimethylamino-p-cresol (solid)
N,N'-disalicylidene-1,2-propane diamine (liquid)
1,2,3-benzotriazole (solid)
Tricresyl phosphate (liquid)
1,4-dihydroxyanthraquinone (solid)
Sulfurized 9-octadecenoic acid (liquid)
Azelaic acid (solid)
Dimer acid (liquid)
N-benzyl-3,7-dicotyl phenothiazine (solid)
Phenothiazine (solid)
Dioctyl phenothiazine (solid)
Sebacic acid (solid)
Acryloid HF-866 (liquid)
Acryloid HF-844 (liquid)
Guanidino salicylamide salt (liquid)
Nonyl phenol (liquid)
Phosphonate salt (liquid)
Tris(β-chloroethyl)phosphate (liquid)

MATERIALS AND METHODS

ANIMALS

Male Sprague-Dawley rats weighing from 200 to 300 grams and male ICR mice weighing from 25-40 grams were obtained from Harlan Industries, Inc., for use in the LD_{50} determinations. Female New Zealand albino rabbits and male Hartley derived guinea pigs were obtained from Sweetwater Farms for use in the skin irritation and skin sensitization studies.

ACUTE ORAL TOXICITY - LD_{50} DETERMINATION

As a preliminary screen for the test materials, an oral dose of 5.0 g/kg body weight was administered to two rats. If no mortality occurred, the material was considered not to be toxic and no further oral toxicity tests were conducted. If mortality occurred, an oral LD_{50} was determined.

Solutions of the materials were prepared with corn oil or propylene glycol and administered in geometrically spaced doses using syringes and special oral dosing needles. Animals were fasted at least 16 hours prior to dosing to allow for a more uniform absorption of the material. Animals were weighed at the time of dosing to determine the proper dosing volume. For LD_{50} determinations, groups of five rats or mice were used per concentration. Animals were observed for 14 days after dosing. Any deaths occurring during this period were included in the final mortality results. The moving average interpolation method of Weil (1952) was used to determine the LD_{50} and 95% confidence limits. The following criteria, as published by Back et al. (1972), were used to classify the materials.

	Extremely Toxic	Highly Toxic	Toxic
Oral, 14-day Single Dose LD_{50}	5 mg/kg or less	>5-50 mg/kg	>50-5000 mg/kg

PRIMARY SKIN IRRITATION

The primary skin irritation potential of the materials was measured by a patch test technique on intact and abraded skin areas of albino rabbits. Six rabbits were used for evaluation of each compound. The dorsal area of each rabbit was clipped free of hair 24 hours prior to administration of the compound, thus allowing irritation from the clipping process to heal. Equal numbers of exposures were made on the intact and abraded

skin. Abrasions were minor incisions through the stratum corneum which were not deep enough to disturb the derma or to produce bleeding. The materials were applied in quantities of 0.5 grams for solids and 0.5 ml for liquids. Each site was covered with a 1 x 1 inch piece of surgical gauze two layers thick followed by a 4 x 4 inch piece of Elastoplast adhesive tape. The entire area was covered with rubber dental dam and secured with more Elastoplast tape. The rabbits were then fitted with leather restraining collars to prevent disturbance of the patch area. After 24 hours, the collars, dental dam, and patches were removed. Any reaction resulting from the test material was evaluated at this time and again at 72 hours post application using the method of Draize et al. (1959).

SKIN SENSITIZATION

Twenty male albino guinea pigs were used to test the sensitizing potential of the materials. The sensitization test was started on a Monday when the guinea pigs were weighed and closely clipped on the scapular areas. The material (0.05 ml of a 0.1% dilution in peanut oil) was injected intradermally into the upper right scapular area of each pig. A similar injection of peanut oil alone into the upper left scapular area served as a control site. Readings were made 24 and 48 hours later.

Doses of 0.1 ml of the same dilutions (freshly prepared) were injected into the clipped dorsal lumbo-sacral areas of the guinea pigs on the following Wednesday, Friday, Monday, etc., until seven doses were administered. Care was taken to insure that the repeated doses were not injected into the same site.

The guinea pigs were rested for three weeks (incubation period), weighed and given a challenge dose of 0.05 ml of the 0.1% dilution of the test material into the lower right scapular area. A control injection of the vehicle alone was also administered into the lower left scapular area at this time. The reactions were read after 24 and 48 hours.

The grading system is designed so that the intensity of the skin reaction is represented by a proportionate numerical value and also that any reaction elicited by the vehicle (control substance) is subtracted from the reaction elicited by the test material and vehicle combined.

The product of the width and length of the wheal (in mm) is multiplied by the following reaction scores to determine a final grade:

0 = needle puncture ("np") - no wheal

1 = very faint pink ("vfp") - no value for this reaction

2 = faint pink ("fp")

3 = pink ("p")

4 = red ("r")

5 = bright red ("R")

6 = edema - <1 mm in height ("e")

7 = edema - >1 mm in height ("E")

*8 = necrosis - <1 sq. mm ("n")

*9 = necrosis - >1 sq. mm ("N")

*The product of the width and length of the necrotic area multiplied by 8 or 9 is added to the numerical value of the foregoing reactions that are present and calculated in the same manner.

As a characterization of the sensitizing response which may be expected from exposure to the test material, the final grade was compared with the following categories.

Final Grade	Sensitizing Response
0-25	None
26-99	Mild
100-200	Moderate
>200	Severe

The sensitizing potential of the test material is estimated from the number of animals giving a response with a final grade of at least 25. The scale for this estimation is shown below:

Number Sensitized (N=20)	Sensitizing Potential
1-3	Slight
4-10	Moderate
11-20	Severe

RESULTS

The results of the acute oral toxicity data for the 21 materials tested are given in Table 2. Most of these chemical compounds are categorized as below toxic by this route of administration. When partial mortality or no deaths occur at the 5000 mg/kg dose level, no further testing is conducted since larger doses cannot be loaded into the gastrointestinal tract. With

guanidino salicylamide salt it was necessary to form a paste with corn oil and we were unable to give a large enough dose to cause any deaths in CF-1 mice. The rats used for oral dosing were Sprague-Dawley strain received from Carworth Farms.

TABLE 2. ACUTE ORAL TOXICITY OF AIR FORCE CHEMICALS

Compound	Species Male	LD_{50} (95% C.L.) in mg/kg	Data Used to Calculate LD_{50} in mg/kg (Mortality Response, N = 2)	Classification
3-amino-1,2,4-triazole	Rat	>5000	5000(0)	Below Toxic
Salicyl amino guanidine	Rat	>5000	5000(0)	Below Toxic
2,6-ditert-butyl-di-methylamino-p-cresol	Rat[a]	1189(669-2111)	500(0),1000(3),2000(4)	Toxic
	Mouse[a]	307(190-496)	125(0),250(2),500(4), 1000(5),2000(5)	Toxic
N,N'-disalicylidene-1,2-propane diamine	Rat[a] Mouse[b]	2279(1344-3868)	1140(1),2280(2),4560(5)	Toxic
1,2,3-benzotriazole	Rat	1072(725-1585)	500(0),1000(2),2000(5)	Toxic
	Mouse	615(540-701)	500(0),630(3),794(5)	Toxic
Tricresyl phosphate	Rat	>5000	5000(0)	Below Toxic
1,4-dihydroxyanthra-quinone	Rat	>5000	5000(0)	Below Toxic
Sulfurized 9-octa-decenoic acid	Rat	>5000	5000(0)	Below Toxic
Azelaic acid	Rat	>5000	5000(0)	Below Toxic
Dimer acid	Rat	>5000	5000(0)	Below Toxic
N-benzyl-3,7-dioctyl phenothiazine	Rat	>5000	5000(0)	Below Toxic
Phenothiazine	Rat[a,b]		5000(3)	
Dioctyl phenothiazine	Rat	>5000	5000(0)	Below Toxic
Sebacic acid	Rat	>5000	5000(0)	Below Toxic
Acryloid HF-866	Rat	>5000	5000(0)	Below Toxic
Acryloid HF-844	Rat	>5000	5000(0)	Below Toxic
Guanidino salicylamide salt	Rat[b]		5000(2)	Borderline Toxic
Nonyl phenol	Rat[a]	2462(1788-3389)	1000(0),2000(1),4000(5)	Toxic
	Mouse[a]	1231(910-1665)	500(0),1000(1),2000(5) 4000(5)	Toxic
Phosphonate salt	Rat[b]		5000(2)	
Tris(ß-chloroethyl) phosphate	Rat[a]	1131(499-2847)	200(0),400(0),800(0), 1600(3)	Toxic
	Mouse[a]	1866(1289-2701)	500(0),1000(0),2000(3), 4000(5)	Toxic

[a] Five animals per level.
[b] Supply of the compound was limited and used for other tests.

Only two of the compounds produced an irritation at the 24 or 72 hour readings. Salicyl amino guanidine treatment resulted in slight erythema and edema in three of the rabbits at 24 hours. Examination at 27 hours postexposure showed that the edema had generalized over the patch location and that five of the six rabbits had developed coriaceousness. One week after the exposure the "leathery" patches of skin had fissured and had begun to peel off. The primary irritation index score was determined to be 1.6, characteristic of mild irritation. However, the score is based upon edema and erythema results with necrotic development not being considered. In view of the tissue damage which resulted, the material should be considered a moderate to severe irritant.

Phosphonate salt produced slight erythema and edema at 24 hours. The edema had reduced at 72 hours, but the erythema was still present. The primary irritation index score was determined to be 2.4, thus classifying the material in the mild to moderate range.

All other compounds were found to be nonirritating at 24 and 72 hours postexposure examinations. Many of the liquid compounds apparently reacted with the adhesive of the patches and caused localized reactions. However, the reaction under the gauze patch was nil, thus the classification of nonirritating.

Skin sensitization and sensitization potential data were determined for Hartley strain guinea pigs. The results of these determinations on 17 compounds are presented in Table 3. The categorization of 1,4-dihydroxyanthraquinone as a compound with "slight" sensitization potential resulted when only two of the 20 guinea pigs tested reacted when given the challenge injection. The mean score for each of the two guinea pigs that reacted was over 800 which indicates a severe response. The mean for the entire group response diluted out the severity of this reaction and while only a small portion of any population might react to this material, the reaction for these individuals can be very intense. Special care should be taken in the handling of this compound to prevent skin contact and sensitization.

TABLE 3. SKIN SENSITIZATION TEST RESULTS ON 17 AIR FORCE MATERIALS DETERMINED IN GUINEA PIGS

Compound	Sensitization Response	Sensitization Potential
3-amino-1,2,4-triazole	None	None
Salicyl amino guanidine	Mild	Moderate
2,6-ditert-butyl-dimethyl-amino-p-cresol	Mild	Slight
1,2,3-benzotriazole	Mild	Slight
Tricresyl phosphate	None	None
1,4-dihydroxyanthraquinone	Severe	Slight
Sulfurized 9-octadecenoic acid	Mild	Moderate
Azelaic acid	Mild	Moderate
Dimer acid	None	None
N-benzyl-3,7-dioctyl phenothiazine	Mild	Slight
Phenothiazine	None	None
Dioctylphenothiazine	Mild	Moderate
Sebacic acid	Mile	Slight
Acryloid HF-866	Mild	Slight
Acryloid HF-844	Mild	Slight
Nonyl phenol	Moderate	Severe
Tris(β-chloroethyl)phosphate	Moderate	Moderate

Nonyl phenol received a sensitization potential classification of severe since 18 of the 20 guinea pigs showed a reaction upon the challenge injection.

The sensitization tests were not conducted on three compounds, phosphonate salts, guanidino salicylamide salt and N,N'-disalicyldene-1,2-propane diamine because the supply of material available was exhausted in conducting other tests. Individual toxicity data sheets are presented in the Appendix of this report for each compound.

REFERENCES

Back, K. C., A. A. Thomas and J. D. MacEwen, (1972), Reclassification of Materials Listed as Transportation Health Hazards Report, No. TSA 20-72-3, Department of Transportation.

Draize, J. H., (1959), "Dermal Toxicity," in Appraisal of the Safety of Chemicals in Foods, Drugs, and Cosmetics, The Staff of the Division of Pharmacology of the Federal Food and Drug Administration, Austin, Texas, The Editorial Committee of the Association of Food and Drug Officials of the United States, p. 51.

Weil, C. S., (1952), "Tables for Convenient Calculation of Median Effective Dose (LD_{50} or ED_{50}) and Instructions in Their Use," Biometrics, 8:249-263.

APPENDIX

AIR FORCE MATERIALS

COMPOUND: 3-amino-1,2,4-triazole

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
5000	0/2		

LD_{50} (mg/kg): >5000
95% C.L.:

LD_{50} (mg/kg):
95% C.L.:

Classification: Below Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

No irritation.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
None	None

COMPOUND: Salicyl amino guanidine

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
5000	0/2		

LD_{50} (mg/kg): >5000
95% C.L.:

LD_{50} (mg/kg):
95% C.L.:

Classification: Below Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

Salicyl amino guanidine produced erythema and edema in 3 rabbits at 24 hours. Five of the 6 rabbits had developed oriaceousness at 72 hours. One week after application the "leathery" patches of skin had fissured and had begun to peel off. Irritation classified as severe.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
Mild	Moderate

AIR FORCE MATERIALS

COMPOUND: 2,6-ditert-butyl-dimethylamino-p-cresol

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
500	0/5	125	0/5
1000	3/5	250	2/5
2000	4/5	500	4/5
		1000	5/5

LD_{50} (mg/kg):	1198	LD_{50} (mg/kg):	307
95% C.L.:	669-2111	95% C.L.:	190-496

Classification: Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

No irritation.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
Mild	Slight

COMPOUND: N,N'-disalicylidene-1,2-propane diamine

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
1140	1/5	Not determined because of limited supply.	

LD_{50} (mg/kg):	2279	LD_{50} (mg/kg):
95% C.L.:	1344-3868	95% C.L.:

Classification: Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

No irritation.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
Not determined because of limited supply.	Not determined because of limited supply.

AIR FORCE MATERIALS

COMPOUND: 1,2,3-benzotriazole

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
500	0/5	500	0/5
1000	2/5	630	3/5
2000	5/5	794	5/5

LD_{50} (mg/kg):	1072	LD_{50} (mg/kg):	615
95% C.L.:	725-1585	95% C.L.:	540-701

Classification: Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

No irritation.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
Mild	Slight

AIR FORCE MATERIALS

COMPOUND: Tricresyl phosphate

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
5000	0/2		

LD_{50} (mg/kg): >5000
95% C.L.:

LD_{50} (mg/kg):
95% C.L.:

Classification: Below Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

No irritation.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
None	None

AIR FORCE MATERIALS

COMPOUND: 1,4-dihydroxyanthraquinone

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
5000	0/2		

LD_{50} (mg/kg): >5000
95% C.L.:

LD_{50} (mg/kg):
95% C.L.:

Classification: Below Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

No irritation.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
Severe	Slight

AIR FORCE MATERIALS

COMPOUND: Sulfurized 9-octadecenoic acid

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
5000	0/2		

LD_{50} (mg/kg): >5000
95% C.L.:

LD_{50} (mg/kg):
95% C.L.:

Classification: Below Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

No irritation.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
Mild	Moderate

COMPOUND: Azelaic acid

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
5000	0/2		

LD_{50} (mg/kg): >5000
95% C.L.:

LD_{50} (mg/kg):
95% C.L.:

Classification: Below Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

No irritation.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
Mild	Moderate

AIR FORCE MATERIALS

COMPOUND: Dimer Acid

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
5000	0/2		

LD_{50} (mg/kg): >5000
95% C.L.:

LD_{50} (mg/kg):
95% C.L.:

Classification: Below Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

No irritation.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
None	None

AIR FORCE MATERIALS

COMPOUND: N-benzyl-3,7-dioctyl phenothiazine

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
5000	0/2		

LD_{50} (mg/kg): >5000
95% C.L.:

LD_{50} (mg/kg):
95% C.L.:

Classification: Below Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

No irritation.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
Mild	Slight

COMPOUND: Phenothiazine

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
5000	3/5		

Supply of the material was limited and used for other tests.

LD_{50} (mg/kg):
95% C.L.:

LD_{50} (mg/kg):
95% C.L.:

Classification: Borderline Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

No irritation.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
None	None

AIR FORCE MATERIALS

COMPOUND: Dioctyl phenothiazine

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
5000	0/2		

LD_{50} (mg/kg): >5000
95% C.L.:

LD_{50} (mg/kg):
95% C.L.:

Classification: Below Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

No irritation.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
Mild	Moderate

COMPOUND: Sebacic acid

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
5000	0/2		

LD_{50} (mg/kg): >5000
95% C.L.:

LD_{50} (mg/kg):
95% C.L.:

Classification: Below Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

No irritation

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
Mild	Slight

AIR FORCE MATERIALS

COMPOUND: Acryloid HF-866

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
5000	0/2		

LD_{50} (mg/kg): >5000
95% C.L.:

LD_{50} (mg/kg):
95% C.L.:

Classification: Below Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

No irritation.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
Mild	Slight

AIR FORCE MATERIALS

COMPOUND: Acryloid HF-844

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
5000	0/2		

LD_{50} (mg/kg): >5000
95% C.L.:

LD_{50} (mg/kg):
95% C.L.:

Classification: Below Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

No irritation.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
Mild	Slight

AIR FORCE MATERIALS

COMPOUND: Guanidino salicylamide salt

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
5000	1/2		

Supply of the material was limited and used for other tests.

LD_{50} (mg/kg):
95% C.L.:

LD_{50} (mg/kg):
95% C.L.:

Classification: Borderline Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

No irritation.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
Not determined because of limited supply.	Not determined because of limited supply.

COMPOUND: Nonyl phenol

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
1000	0/5	500	0/5
2000	1/5	1000	1/5
4000	5/5	2000	5/5
		4000	5/5

LD_{50} (mg/kg):	2462	LD_{50} (mg/kg):	1231
95% C.L.:	1788-3389	95% C.L.:	910-1665

Classification: Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

No irritation.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
Moderate	Severe

COMPOUND: Phosphonate salt

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
5000	2/5		

Supply of the material was limited and used for other tests.

LD_{50} (mg/kg):
95% C.L.:

LD_{50} (mg/kg):
95% C.L.:

Classification: Borderline Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

Phosphonate salt produced slight erythema and edema at 24 hours. Irritation classified as mild.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
Not determined because of limited supply.	Not determined because of limited supply.

COMPOUND: Tris(β-chloroethyl)phosphate

1. ACUTE ORAL TOXICITY

Rats		Mice	
Dose (mg/kg)	Mortality Ratio	Dose (mg/kg)	Mortality Ratio
200	0/5	500	0/5
400	0/5	1000	0/5
800	0/5	2000	3/5
1600	3/5	4000	5/5

LD_{50} (mg/kg):	1131	LD_{50} (mg/kg):	1866
95% C.L.:	499-2847	95% C.L.:	1289-2701

Classification: Toxic

2. PRIMARY SKIN IRRITATION - Rabbits

No irritation.

3. SKIN SENSITIZATION - Guinea Pigs

Sensitization Response	Sensitization Potential
Moderate	Moderate

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